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XVI.—*The Landshells of Perak.*—By O. F. VON MÖLLENDORFF, PH. D.
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The following notes are based on a collection made by Deputy Surgeon-General R. Hungerford during a short visit to Perak, and on a number of shells received by the Indian Museum from Larut. I have thought it advisable to combine with the description of these a list of all species hitherto known from Perak. So far as I know, only the following papers have been published on the subject:—

H. CROSSE, Mollusques nouveaux de Perak. *J. de Conch.*, xxvii, 1879, pp. 198—208 (5 sp.).

H. CROSSE, Faune malacologique de Perak. *Ibid.*, pp. 336—340 (18 sp.).

H. H. GODWIN-AUSTEN and G. NEVILL, Shells from Perak (and the Nicobar Islands). *Proc. Zool. Soc. Lond.*, 1879, pp. 734—740 (9 sp.).

J. DE MORGAN, Note sur quelques espèces nouvelles de mollusques terrestres recueillis dans la Péninsule Malaise. *Le Naturaliste*, vii, 1885, No. 9, pp. 68—70 (16 sp.).

STREPTAXIDÆ.

1. STREPTAXIS PLUSSENSIS, de Morgan.

de Morgan, *Le Natur.*, vii, 1885, No. 9, p. 68.

“Heliciform, of whitish colour, spire regular, very flat, base ventrose, smooth, upper side transversely striate. Umbilicus very wide,

inner sides of all the whorls being visible, aperture triangular, slightly oblique, very irregular, having a tooth on the penultimate whorl and a groove ("sillon") in the upper part; 6 whorls, linear suture." Diam. maj. 7, alt. 3 mill.

HAB.—Mt. Tchékèl in the valley of the river Pluss.

This description is not sufficient to enable one to form an idea of the value of the species, which has to be compared with the several species described from the Malay peninsula.

2. ENNEA PERAKENSIS, Godwin-Austen & G. Nev.

Godwin-Austen & Nevill, P. Z. S., 1879, p. 735, t. lix, f. 2.

Dr. Townsend found two apparently immature specimens of an *Ennea* at Buket Pondong, which the late Mr. G. Nevill considered to be full-grown and to be the type of a new subgenus of *Ennea*. Col. Godwin-Austen, however, deemed it best, considering only two specimens were found and that these were so similar in general form to immature specimens of *Ennea stenopylis*, Bens., from the Khasi Hills, not to found this new subgenus until further examples were obtained proving that the shell was a mature form. The results of Mr. Hungerford's investigations have justified Col. Godwin-Austen's caution. He found this *Ennea* in different stages of maturity, some entirely corresponding to the figure above quoted, but also some full-grown. The diagnosis has accordingly to be altered as follows:—

Testa aperte perforata, cylindraco-claviformis, solidula, nitida, viridescenti-crystallina, anfr. 2 apicales fere glabrati, tertius confertim costulatus, reliqui 4½ costulis validis, planiusculis, subdistantibus, paullum arcuatis sculpti, ultimus penultimo angustior, circa umbilicum valde compressus, obtuse carinatus, antice substrangulatus, scrobiculatus. Apertura fere verticalis, rotundato-tetragona, peristoma latiuscule expansum, albolabiatum, margine externo ad insertionem subito attenuato, sinuato. Lamella parietalis valida usque ad marginem producta, callo dentiformi in palato opposito. Long. 4, diam. 2 mill.

The other teeth which immature specimens show on the columella and in the palate, disappear in the full-grown shell. The analogy with *E. stenopylis*, Bens., pointed out by Godwin-Austen, exists also in full-grown specimens. *E. perakensis* is, however, a little longer, more cylindrical, the costulation more distant, and the ribs higher and less arcuate.

Our species as well as the following one belongs to the group of Indian and Chinese species for which the late Mr. Nevill has founded the subgenus *Martensia*. This name has, however, been pre-occupied by Semper (Landsch-Philipp., I, 1870, p. 42) for a genus of the *Zonitidæ*,

type *Nanina mossambicensis*, Pfr. Although *Martensia*, Semp., has been considered a synonym of *Trochonanina*, Mouss., by some authors, doubts have been expressed more recently whether the Polynesian species of *Trochonanina* really belong to the same section as the East African carinate forms of *Nanina*. If not, *Martensia*, Semp., has to be retained for the latter group, and the section *Martensia*, Nev., has to be renamed.

3. ENNEA HUNGERFORDIANA, n. sp.

T. aperte perforata, ovato-conica, sulcis validiusculis, subdistantibus verticalibus sculpta, viridescenti-crystallina; anfr. 6½ convexiusculi, ultimus angustior, basi valde compressus, substrangulatus, valde scrobiculatus, paullum ascendens. Apertura verticalis, parva, irregulariter ovalis, peristoma late expansum, margine externo ad insertionem subito attenuato, recedente, profunde sinuato. Lamella parietalis altissima, callum dentiformem marginis externi fere attingens et cum illo sinulum fere circulare formans. Long. 3, diam. 1½ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

Smaller and more ovate than the last. The greatest peculiarity of the species is the sinulus of the aperture. In most species of *Ennea*, the parietal lamella is opposed to a tooth or dentiform callosity in the outer margin of the peristome, which latter gets suddenly thinner from that place to the insertion and is more or less sinuate. Thus the lamella and tooth enclose a more or less circular orifice connected with the rest of the aperture by a small canal. In our species, the lamella is so much prolonged that it all but touches the tooth of the outer margin, and it looks as if the lamella really were the continuation of the peristome. The latter is, from the tooth upwards, not only suddenly attenuate, but also receding, so that the orifice or sinulus is hardly visible in front, but appears, when the shell is turned sideways, very much like a commencing tube. The only species in which I have seen a similar formation is *Ennea vara*, Bens., otherwise widely different from *E. hungerfordiana*.

NANINIDÆ.

4. *ARIOPHANTA*, n. sp. (?), (prox. N. (A.) *INTERRUPTA*), G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 20.

Nualla Kangsa, Perak; coll. Dr. Edmond Townsend.

No species of *Ariophanta* was found by Mr. Hungerford.

5. RHYSOTA, sp.

Mr. Hungerford obtained a single specimen of a fine large *Nanina*, diam. 55, alt. 32 mill. It is greenish-brown with a narrow dark brown

band round the periphery and another broader one round the umbilicus, the periphery is obtusely angulate, the spiral rugose sculpture is coarser above, finer and more regular at the base; 6 moderately convex whorls form a little elevated spire. The nearest relation seems to be *Nanina pluto*, Pfr., from Cambodja, but it is probably a new species which I do not care to describe from a single example.

6. HEMIPLECTA CYMATIUM, Bens.

Perak, without distinct locality (*Hungerford*). The single specimen agrees fairly well with the figure and description of *Nanina cymatium*, known from Penang and Malacca.

7. EUPLECTA BIJUGA, Stoliczka.

Stoliczka, J. A. S. B., xlii, pt. 2, 1873, p. 14, t. i, f. 4—7, t. ii, f. 16—18 (*Rotula*). *Helix bijuga*, Pfeiffer, Mon. Hel., vii, 1876, p. 103. *Nanina bijuga*, G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 31. *Nanina (Rotula) bijuga*, Crosse, J. de Conch., xxvii, 1879, p. 336.

Buket Pondong (*Dr. Townsend, Hungerford*), originally described from Penang.

8. MACROCHLAMYS, sp.

Mr. Hungerford found a few dead specimens at Buket Pondong which fairly agree with the form figured by Godwin-Austen (*Land & Freshw. Moll. Ind.*, iv, 1883, p. 110, t. xxvi, f. 4) and mentioned by him as "*M. consepta*, Bens., small var. ?" from Tenasserim.

9. MACROCHLAMYS, sp. an nova ?

A single specimen from Buket Pondong. Small, 3 mill. long and 2 high, horn brown, well-polished, probably new.

There is besides another much smaller species of *Macrochlamys* and a species of *Microcystis*, which I have likewise left undescribed on account of the very scanty material.

10. MICROCYSTINA TOWNSENDIANA, Godwin-Austen & G. Nevill.

Godwin-Austen & Nevill, P. Z. S., 1879, p. 736, t. lix, f. 1.

Buket Pondong (*Dr. Townsend, Hungerford*).

11. KALIELLA PERAKENSIS (G. Nevill), Godwin-Austen.

Godwin-Austen, *Land & Freshw. Moll. Ind.*, i, 1882, p. 8, t. ii, f. 7.

Perak (*Dr. Townsend*), Buket Pondong (*Hungerford*).

12. SITALA CARINIFERA, Stoliczka.

Stoliczka, J. A. S. B., xlii, pt. 2, 1873, p. 16, t. i, f. 8. Godwin-Austen, *Land & Freshw. Moll. Ind.*, ii, 1882, p. 35.

Penang (*Stoliczka*). Mr. Hungerford found two badly preserved specimens at Buket Pondong which agree entirely with *Stoliczka*'s figure and description.

HELICIDÆ.

13. *HELIX* (*TRACHIA*) *MALAYANA*, n. sp.

T. latiuscule umbilicata, depressa, tenuis, pilis brevissimis in lineas regulares valde approximatas dispositis hirsuta, rufobrunnea; anfr. 5½ perconvexi sutura valde impressa juncti, spiram fere planam apice viâ prominulo efficientes, ultimus maximus, valde inflatus, antice breviter descendens, circa umbilicum subacute angulatus, apertura non valde obliqua, rotundato-lunaris, peristoma tenue, breviter expansum, viâ reflexiusculum, sinuosum, roseum. Diam. maj. 23, min. 18, alt. 14 mill.

HAB.—In regione Perak, leg. cl. R. Hungerford.

I have little doubt that this is the form mentioned by Crosse (J. de Conch., 1879, p. 336) as *H. (Planispira) breviseta*, Pfr., from Buket Pondong, but judging from Pfeiffer's diagnosis—all I can compare at present—I do not believe that the Perak form can be combined with Pfeiffer's Siamese species. The latter is pale yellow ("pallide fulvida"), round the umbilicus only "subangulatus," the peristome is white, the dimensions are 22 mill. diam., 10½ mill. alt., there are only 5 whorls. There appears to be a great deal of affinity, and the comparison of the types may probably result in making the Perak form a variety of *H. breviseta*, Pfr., but for the present I prefer to give it a separate name.

14. A second species of *Trachia*, of which only a few dead examples were found at Buket Pondong, is smaller, the whorls increase more regularly and the last one is not so prominently large; the spine is a little more prominent, the angle round the umbilicus much more obtuse. This is perhaps *Trachia penangensis*, Stol.

15. *HELIX PERAKENSIS*, Crosse.

Crosse, J. de Conch., xxvii, 1879, p. 199, t. viii, f. 4 (*Geotrochus*).

Perak (*Dr. Townsend*), not found by Mr. Hungerford. I have some doubts about its really being a *Geotrochus*, a group which has not yet been observed in the Indian region. The figure gives the idea rather of *Satsuma* (or *Fruticotrochus*, Kob.), which group is widely spread in China, and might very well range into the Malay peninsula hitherto so little explored.

Mr. de Morgan's paper contains the following *Helix*:—

16. *HELIX SWETTENHAMI*, de Morgan.

de Morgan, l. c., p. 68.

Upper portion of the Kinta valley. 16 mill. wide, 10 high; flat, strongly keeled, peristome acute, columellar margin reflected to the umbilicus. May be a *Trochomorpha* or a *Plectotropis*.

17. *HELIX THIEROTI*, de Morgan.

de Morgan, l. c., p. 68.

"Gounong-Teheura," N. of Ipoh, Kinta valley.

Similar to the last, but discoid, reddish brown, diam. 15, alt. 4 mill. This is most probably a *Trochomorpha*.

18. *HELIX HARDOUINI*, de Morgan.

de Morgan, l. c., p. 68.

Kinta valley between Lahat and Ipoh.

Diam. 17 mill., alt. 8 mill., flat, strongly keeled, peristome expanded ("évasé.") Perhaps also a *Trochomorpha* or else a *Plectotropis*.

19. *HELIX LAHATENSIS*, de Morgan.

de Morgan, l. c., p. 68.

Between Lahat and Ipoh, Kinta valley.

Diam. 25 mill., alt. 14 mill., flat, slightly ("légèrement") umbilicated, strongly keeled, yellow ("blonde"), transparent, peristome acute, thin, columellar margin slightly reflected towards the umbilicus. Might also be a *Trochomorpha*.

BULIMIDÆ.

20. *AMPHIDROMUS PERVERSUS*, Linn.

Perak (*Dr. Townsend*).

STENOGYRIDÆ.

21. *STENOGYRA (OPEAS) GRACILIS*, Hutton.

Buket Pondong (*Hungerford*).

22. *STENOGYRA (SUBULINA) TCHEHELENSIS*, de Morgan.

T. elongate turrita, gracilis, tenuis, transverse densissime arcuatim striatula, corneo-flavida, opaca; anfr. 12 planiusculi, spiram elongatam apice subacuto efficientes; apertura obliqua, angulate ovalis, peristoma acutum, margine dextro sinuoso; columella subincrassata, paullum arcuata, basi truncata, cum margine basali angulum rotundatum formans.

Long	33½	diam.	6	mill.	(anfr.	12)
„	24½	„	4¾	„	(„	10)
„	23	„	5	„	(„	„)
„	21	„	4½	„	(„	9½)

1878. *Stenogyra (Opeas) terebralis* ?, Theobald (? n. sp.) G. Nevill, *Handl. Moll. Ind. Mus.*, 1878, p. 166.

1879. *Stenogyra tchehelensis*, J. de Morgan, *Le Naturaliste*, vii, 1885, No. 9, p. 69.

HAB.—Mt. Tchéhèl prope flumen Pluss (*de Morgan*), Buket Pondong (*Dr. E. Townsend, Hungerford*).

I cannot but believe that the fine *Subulina* collected by Mr. Hungerford at Buket Pondong is the same which Mr. Nevill mentions from the same locality as a doubtful *H. (Opeas) terebralis*, Theob., or a n. sp. I have no figure of Theobald's species at my disposal—has it been figured at all? the *Conchologia Indica* does not give it—but if the species of the Shán States is really an *Opeas*, it cannot be identical with the Perak form, which decidedly belongs to *Subulina*. De Morgan's description of his *H. tchehelensis* is somewhat vague and apparently was taken from immature examples, but, as the dimensions given by him of a specimen having 10 whorls—23 × 5 mill. agree perfectly with those of some younger specimens in Mr. Hungerford's collection, I think the two forms of different Perak localities may be safely combined.

23. RHODINA PERAKENSIS, J. de Morgan.

de Morgan, l. c. 1885, p. 68.

Limestone rocks of Gounong Tcheura near Ipoli, Kinta valley, under dead leaves.

Mr. de Morgan has founded a new genus for a curious *Stenogyra*-like shell, which he considers to be related to *Rhodea*. It may be worth while to translate his description here:—"Shell cylindraceous, striate, dextrorse, numerous whorls, apex obtuse, last whorl much larger than the penultimate, aperture triangular, columellar margin reflected and very prominent ["saillant"], peristome continuous. Differs from the genus *Rhodea* by the aperture "disposée en cornet" and by the want of a keel." I must confess that I fail to perceive any relation to *Rhodea* from these remarks. The descriptive notes on the species are meagre also; it is cylindrical, fragile, horny yellow, has 10 regularly increasing whorls very regularly and distinctly striate, the suture is linear and well-marked, the aperture triangular, oblique, peristome thin, not reflected ("non déjeté"). Long. 25, diam. of last whorl 4½, long. of aperture 5, lat. 3 mill.

It is to be regretted that this apparently very interesting form has not been figured. Might it not be related to *Perrieria*, Tapp.-Can., of Borneo?

CLAUSILIIDÆ.

24. CLAUSILIA (PSEUDONENIA) FILICOSTATA, Stoliczka,

Stoliczka, J. A. S. B., xlii, pt. 2, 1873, p. 28, t. iii, f. 7, 8.

Var. *tenuicosta*, G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 183. H. Crosse, J. de Conch., xxvii, 1879, p. 337.

Buket Pondong (*Dr. Townsend, Hungerford*).

The few badly preserved specimens which Mr. Hungerford found at Buket Pondong seem to justify Mr. Nevill's classification of the Perak form as a variety of the Penang *Clausilia filicostata*. The variety is longer, up to 24 mill., at the same time slenderer, the striation is much finer so that it could hardly be called costulate, there are fine spiral lines besides, 12 whorls instead of 10—11. It might even be separated as a species, especially if there are differences in the closing apparatus, the description of which is insufficient in Stoliczka's diagnosis. As I am unable to compare specimens of the typical *Clausilia filicostata*, I must leave this question undecided.

PUPIDÆ.

25. HYPSELOSTOMA BENSONIANUM, W. Blanford.

W. Blanford, Contr. Ind. Mel., iv, 1863, p. 8. Pfeiffer, Mon. Hel., v, 1868, p. 437. Conch. Ind., t. viii, f. 2.

Of the three species of *Hypselostoma* hitherto described, *H. bensonianum* is the only one with which the form collected by Mr. Hungerford at Buket Pondong can be combined. Diagnosis and figure agree fairly well, but the latter is not very exact, at least not detailed enough for a small form, and the description might also be more complete. It is besides not very likely that the same species ranges from Ava into Perak, while there occurs another species at Moulmein. A comparison of specimens of *H. bensonianum* with the Perak form may therefore result in separating the latter as a distinct species. Unfortunately I do not possess the Ava species.

CYCLOPHORIDÆ.

CYCLOTINÆ.

26. CYCLOTUS HUNGERFORDIANUS, n. sp.

Testa aperte umbilicata, depressa, plicis distantibus transversis sculpta, in interstitiis plicarum striis transversis subtilibus et lineis spiralibus

rugosulis minutissime granulata, viridescenti-cornea, spira breviter conoidea apice mamillari, nitido. Anfr. 4 teretes, ad suturam profundam planati, ultimus ad aperturam valde descendens, breviter solutus. Apertura diagonalis, circularis, peristoma continuum, rectum. Operculum testaceum, crassum; periphæria sulco late exaratum, extus valde concavum marginibus anfractuum breviter elevatis, anfractus 8 oblique plicato-striati. Diam. maj. $7\frac{1}{2}$, alt. 5 mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

This species is most probably the same which is mentioned in G. Nevill's Handl. Moll. Ind. Mus., 1878, p. 256, as *Cyclotus*, n. sp., found at the same locality by Dr. E. Townsend. It belongs to the group of *C. pusillus*, Sow., *hunanensis*, Gredl., etc., which Prof. von Martens has named *Cycloti suturales* (Landschn. Ostas., 1867, p. 124).

Mr. J. de Morgan describes (l. c., 1885, p. 69) an *Aulopoma lowi* from the Kinta valley, which I suspect to be a *Cyclotus* very similar to, if not identical with, the above species. The dimensions are about the same, 8 and 5 mill., and the short description of the shell agrees very well, especially the remark that the live shell is covered with a layer of mud. This covering seems to be characteristic of the group, as I have observed it, not only in *C. hungerfordianus*, but also in all Chinese and Philippine species. The description of the operculum does not in any way point to *Aulopoma*, hitherto not known out of Ceylon. He calls it circular, horny, composed of lamellæ placed one upon another, slightly convex on the inner side. This might fairly well apply to the operculum of a *Cyclotus*, certainly not to that of an *Aulopoma*. If my supposition as to the identity of the two species be correct, the question arises whether the rules of priority require that the species should be called *Cyclotus lowi*, de Morg. I think that the publication of a *Cyclotus* as an *Aulopoma* in such an insufficient way that its identity can only be guessed, does not entitle it to priority, but, as this can only be decided after typical specimens of both species have been compared, I have thought it better to publish the species collected by Mr. Hungerford under a new name.

27. OPISTHOPORUS SOLUTUS, Stoliczka.

Stoliczka, J. A. S. B., xli, pt. 2, 1872, p. 266, t. x, f. 8—10. Pfeiffer, Mon. Pneum., suppl. iii, 1876, p. 44. G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 263. H. Crosse, J. de Conch., xxvii, 1879, p. 337.

Buket Pondong (*Dr. Townsend, Hungerford*); Penang (*Stoliczka*).

28. OPISTHOPORUS PENANGENSIS, Stoliczka.

Stoliczka, l. c., 1872, p. 265, t. x, f. 7. Pfeiffer, Mon. Pneum., suppl. iii, 1876, p. 43. G. Nevill, Handl., 1878, p. 263. H. Crosse, l. c., 1879, p. 338.

Buket Pondong (*Dr. Townsend, Hungerford*); Penang (*Stoliczka*).

According to Crosse, Prof. von Martens considers this form to be a simple variety of *O. corniculum*, Mouss., of Java, whilst Stoliczka compared it to *O. sumatranus*, Mart., of Sumatra. The descriptions of these species do not, however, mention the two lines of short cilia above and below the periphery (as in *O. biciliatus*, Mouss.), which seems to me to be a good specific character.

CYCLOPHORINÆ.

29. SPIRACULUM ? REGELSPERGERI, de Morgan.

de Morgan, *Le Nat.*, vii, 1885, No. 9, p. 69 (*Cyclophorus*).

“Very depressed, very widely umbilicated, 5 whorls, very finely striate; suture linear, under which there is a deep groove (“sillon”) covered by the margin which forming a canal along the suture is enlarged towards the aperture and ends in a lamina (“lame”) which covers the canal entirely and forms a tube of 4—5 mill. in length. Aperture oblique, nearly circular, slightly reflected, near the suture winged (“échancrée”). Colour horny above, brown at the base, a black band round the periphery, regularly arranged brown spots on the upper side which give the shell the aspect of a rolled-up snake. Operculum circular, horny, inner side presenting a spherical depression with a prominent nucleus in the centre, outer side helicoid (“hélicoïdale”) furnished with very fine membranaceous lamellæ destined to render the fitting of the operculum more hermetic.” Alt. 8, diam. maj. 25, diam. apert. 8 mill.

HAB.—Environs of Lahat and Pappan, Kinta valley (*J. de Morgan*), Larut (*Ind. Mus.*).

I have tried to give a literal translation of de Morgan’s description, which certainly lacks the technical precision of a diagnosis, but at least permits me to recognise his species in an immature example from Larut. It is decidedly not a *Cyclophorus*: I considered the Larut specimen to be a *Pterocyclus* which might, on account of the curious canaliculated suture, be related to *Pterocyclus albersi*, Pfr. De Morgan’s mention of a tube and description of the operculum point to *Spiraculum*; I should also have thought of *Rhiostoma*, but there is no mention of the last whorl being solute. Whether the species is really new or has to be combined with a Burmese or Siamese form I cannot now decide.

30. SPIRACULUM KINTANUM, de Morgan.

de Morgan, l. c., 1885, p. 69 (*Cyclophorus*).

Kinta valley.

This is most probably a *Spiraculum*: the operculum is analogous to that of the last species; there is at a short distance from the aperture a small sutural tube bent backwards. The shell is greenish-brown, much depressed, the last whorl slightly solute. Diam. maj. 19, alt. 5 mill.

31. *CYCLOPHORUS MALAYANUS*, Bens.

Larut (*Ind. Mus.*), Buket Pondong (*Dr. Townsend* teste G. Nevill, *Handl.*, 1878, p. 267), otherwise known from Penang, Siam, Burma.

32. *CYCLOPHORUS SEMISULCATUS*, Sowerby.

Buket Pondong (*Dr. Townsend* teste G. Nevill, *Handl.*, 1878, p. 269, err. typ. "*C. semistriatus*").

33. *CYCLOPHORUS EXPANSUS*, Pfr., ? var.

G. Nevill, *Handl.*, 1878, p. 269, "appears to be new; it is near *C. cybæus*."

Buket Pondong (*Dr. Townsend*).

34. *CYCLOPHORUS LOWI*, de Morgan.

de Morgan, l. c., 1885, p. 69.

Kinta valley, common; Patani. According to the author's remarks this is a fine shell of 55 mill. diameter; the description is, however, so incomplete that no attempt to compare it to a known species can be made. Not even the colour of the shell is indicated. It may be *C. aaurantiacus*, Schum., widely distributed in the Malay peninsula.

35. *LEPTOPOMA ASPIRANS*, Benson.

Buket Pondong (*Dr. Townsend, Hungerford*), Burma, Pegu, Tenasserim.

36. *LAGOCHILUS TOWNSENDI*, Crosse.

Crosse, *J. de Conch.*, xxvii, 1879, pp. 200, 339, t. viii, f. 3, = *Lagocheilus*, n. sp., G. Nevill, *Handl.*, 1878, p. 282, = *Cyclophorus baylei*, de Morgan, l. c., 1885, p. 69.

Buket Pondong (*Dr. Townsend, R. Hungerford*), abundant in the basin of the Perak river, especially in the Pluss valley (*de Morgan*).

Mr. Hungerford brought some specimens from the original habitat which entirely agree with the very exact description of Mr. Crosse. I am rather inclined to consider the Perak shell merely a variety of *L. trochoides*, Stol., from Penang to which it is closely related; being, however, unable to compare specimens of the latter, I follow Messrs. Crosse and Nevill for the present.

So far as can be judged, or rather guessed, from Mr. de Morgan's short remarks on his "*Cyclophorus baylei*," it is a *Lagochilus* and most probably identical with *L. townsendi*, Crosse.

ALYCÆINÆ.

37. *ALYCÆUS GIBBOSULUS*, Stoliczka.

Stoliczka, J. A. S. B., xli, pt. 2, 1872, p. 268, t. x, f. 14. Pfeiffer, Mon. Pneum., suppl. iii, 1876, p. 58. G. Nevill, Handl., 1878, p. 295. Crosse, J. de Conch., xxvii, 1879, p. 339, t. xii, f. 8.

Originally described from Penang, but found at Buket Pondong by Messrs. Townsend and Hungerford. The Perak form presents some slight differences, *viz.*, pale whitish colour, broader base, and more inflated last whorl, but these do not justify the separation even as a variety.

38. *ALYCÆUS PERAKENSIS*, Crosse.

Crosse, J. de Conch., xxvii, 1879, pp. 206, 339, t. xii, f. 7.

Discovered by Dr. Townsend at Buket Pondong, where Mr. Hungerford also collected it in some numbers. Crosse justly compares it with *A. jagori*, Mart., from Java, from which it is, however, well distinguished by its greater size and bright yellow colour, the smaller number of its whorls, its spiral sculpture.

39. *ALYCÆUS DIPLOCHILUS*, n. sp.

Testa late umbilicata, depressa, subdiscoidea, solidula, subtiliter subdistanter costulato-striata, nitidula, rubescenti-cornea; spira breviter conoidea apice obtuso. Anfr. 4 convexi, ultimus ad peripheriam obtuse angulatus, basi valde inflatus, gibbus, ab apertura sat remote (ca. 2 mill.), profunde constrictus, dein tumidulus, sub tubulo suturali brevi ca. ½ mill. longo dense costulatus, ad aperturam glabratus, valde deflexus. Apertura maxime obliqua, subcircularis, peristoma duplex, internum continuum, expansum, externum ab illo sulco distincto separatum, latissime expansum. Diam. maj. 4, min. 3, alt. 2 mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

40. *ALYCÆUS OLIGOPLEURIS*, n. sp.

Testa sat aperte umbilicata, depressa, subdiscoidea, distanter et minute costulata, albescens, nitidula, spira brevissime conoidea, apice obtuso. Anfr. 3½—4 convexi, ultimus basi inflatus, gibbus, ab apertura sat remote constrictus, dein tumidulus, subglabratus, ad aperturam subito deflexus, sub tubulo suturali brevissimo densissime costulatus. Apertura maxime obliqua, subcircularis, peristoma duplex, internum porrectum, duplicatum, externum sulco distincto ab illo separatum, expansum, reflexiusculum. Diam. maj. 2½, min. 1¼, alt. 1⅓ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

Related to the last, but much smaller, more distantly ribbed, ultimate whorl without angulation at the periphery, the inner peristome much more prominent and the outer less widely expanded.

41. *ALYCÆUS MICRODISCUS*, n. sp.

Testa aperte umbilicata, discoidea, densissime costulata, cornea, spira brevissime prominula. Anfr. $3\frac{1}{2}$ —4 convexi, ultimus valde remote ab apertura leviter constrictus, dein distortus et ascendens, ad aperturam breviter deflexus, subtus paulum inflatus, gibbus, tubulus suturalis brevissimus. Apertura parum obliqua, subcircularis, peristoma duplex, externum expansum, reflexiusculum, internum porrectum, expansiusculum. Diam. maj. $2\frac{3}{4}$, min. $1\frac{2}{3}$, alt. 1 mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

The peculiar distorsion of the last whorl, which first ascends after the constriction and is then again deflected towards the aperture, separates this minute species from all forms known to me.

42. *ALYCÆUS PARVULUS*, n. sp.

Testa sat aperte umbilicata, discoidea, confertim et minute costulata, cornea; spira brevissime prominula; anfr. $3\frac{1}{2}$ —4 convexi, ultimus paulum ab apertura remote leviter constrictus, dein tumidulus, basi parum inflatus, subgibbus, tubulus suturalis brevissimus; apertura diagonalis, circularis, peristoma duplex, externum late expansum, internum late porrectum, expansiusculum. Diam. maj. $1\frac{2}{3}$, alt. $\frac{3}{4}$ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

Another minute form, still smaller than the last, to which it appears somewhat related. It differs, however, in the constriction being comparatively nearer to the aperture, the almost regular last whorl, the broad outer and very prominent inner peristome.

43. *ALYCÆUS MICROCONUS*, n. sp.

Testa umbilicata, globoso-conica, costulis confertis transversis et lineis spiralibus quasi reticulata, cornea; anfr. 4 convexi, ultimus pone aperturam leviter constrictus, sub tubulo suturali modico densius costulatus, dein subglabratus, non descendens. Apertura parum obliqua, fere circularis, peristoma breviter expansum, tenue, subduplicatum. Diam. maj. $1\frac{2}{3}$, alt. $1\frac{1}{2}$ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

By the conical shape, the regular last whorl, the reticulate sculpture this small species is very well distinguished from all Indian *Alycæi*.

Mr. J. de Morgan describes, in the paper already mentioned, two species of *Alycæus* from Perak, one of which appears to be a remarkable novelty.

44. *ALYCÆUS JOUSSEAUMEI*, de Morgan.

de Morgan, *Le Natural.*, vii, 1885, No. 9, p. 70.

“White, perforate, depressed, whorls convex, suture deep, last whorl very ventrose and strongly contracted a little above the circular aperture, sculptured by fine transverse striæ; above the contraction a sutural tube, the length of which varies with the age of the shell. Peristome double, reflected, presenting the form of a horseshoe, the concave side of which is turned to the umbilicus. Operculum horny, multispiral, circular, concave, inner side with a prominent central nucleus.” Diam. maj. 11—15 mill., alt. 6, apert. diam. 4 mill.

So far as can be judged from this not very exhaustive description, the species would appear to be related to *A. umbonalis*, Bens., and *physis*, Bens. It is the largest form hitherto described.

HAB.—Limestone hills of the Kinta valley, summit of Mt. Lano.

The other species, *A. chaperi*, de Morg. (l. c., p. 70), is probably *A. gibbosulus*, Stol., or at least closely related to that species; the meagre description does not, however, permit an identification with any degree of certainty.

DIPLOMMATININÆ.

45. *DIPLOMMATINA CANALICULATA*, n. sp.

T. dextrorsa, conico-turrita, costulis acutis distantibus sculpta, corneo-flavesceus, spira elongata, regulariter conica, apice acuto; anfr. 10 perconvexi, ultimus initio constrictus, penultimo multo angustior, ad aperturam ascendens. Apertura verticalis, angulato-subcircularis, peristoma duplex, externum late expansum, reflexiusculum, internum sulco ab illo separatum, expansiusculum, superne appressum. Columella basi truncata, cum margine basali angulum canaliformem formans. Lamella columellaris, validiuscula fere ad marginem producta. Alt. 5, diam. 2 mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

This novelty is well characterized by the long regular conical spire, the distant and very sharp ribs, the curious angle at the base of the columella, which forms almost a canal and is distinctly continued into both peristomes. The latter are prolonged round this angle into a spur-like excrescence. Similar formations are observed in several Indian and Chinese species, but in none are they so well developed as in this.

46. DIPLOMMATINA NEVILLI, Crosse.

Crosse, J. de Conch., xxvii, 1879, pp. 203, 339, t. viii, f. 2 (*Palaina*).

Discovered by Dr. Townsend and also found by Mr. Hungerford at Buket Pondong. I do not know why the author classes it as a *Palaina*; it appears to me to be a typical *Diplommatina* with well-developed columellar lamella. The truncation of the columella and the canal-like angle at its base are similar to those of the last-named species, though not quite so distinct. It is only 3 mill. long.

47. DIPLOMMATINA CROSSEANA, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, P. Z. S., 1879, p. 738, t. lx, f. 3, 3a.

Buket Pondong (*Dr. Townsend, R. Hungerford*).

Very small, only $1\frac{1}{3}$ mill. in length, dextrorse, antepenultimate whorl the largest. I believe it to belong to the section *Diancta*, Mart.

48. DIPLOMMATINA MIRABILIS, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, l. c., p. 739, t. lx, f. 4, 4a, 4b.

Buket Pondong (*Dr. Townsend*), not found by Mr. Hungerford. Dextrorse, $1\frac{3}{4}$ mill. in length. From the figure and description I see no reason why it should be classed as *Palaina*, as the authors have it.

49. DIPLOMMATINA SUPERBA, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, l. c., p. 739, t. lx, f. 5, 5a (*Palaina*).

Buket Pondong (*Townsend and Hungerford*).

This truly "superb" little shell presents, it is true, some similarities with species of *Palaina*, but chiefly in the sculpture, on which subgeneric distinctions should not be based. On account of the constricted penultimate whorl I should class it as a *Diancta*.

50. OPISTHOSTOMA PAULUCCIÆ, Crosse & Nevill.

Crosse & Nevill, J. de Conch., xxvii, 1879, pp. 197, 205, 339, t. viii, f. 1. Godwin-Austen & G. Nevill, Proc. Zool. Soc., 1879, p. 738, t. lx, f. 2, 2a, 2b.

51. OPISTHOSTOMA PERAKENSE, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, l. c., p. 738, t. lx, f. 1, 1a, 1b.

Of these two species, both discovered by Dr. Townsend at Buket Pondong, Mr. Hungerford has, so far as I can see, only found the latter at the same locality.

PUPININÆ.

52. PUPINA ARTATA, Bens.

Buket Pondong (*Dr. Townsend, R. Hungerford*). Known from Ava, Burma.

53. PUPINA ARULA, Bens.

Buket Pondong (*Townsend and Hungerford*), otherwise known from Burma.

54. MEGALOMASTOMA (COPTOCHILUS) SECTILABRUM, Gould.

Perak (*Dr. Townsend*), Larut (*Ind. Mus.*). Described from Tavoy, Tenasserim, and found also on Penang.

55. HYBOCYSTIS ELEPHAS, de Morgan.

de Morgan, *Le Natural.*, vii, 1885, No. 9, p. 70.

Testa anguste umbilicata, pupinæ-formis, solidissima, sublævigata, in anfractu ultimo distinctius rugoso-striata, rufo-carnea vel aurantiaca, spira irregularis ovata, apice conoideo-obtuso; sutura impressa, marginata albescens; anfr. 6 convexiusculi, penultimus multo longior, supra aperturam planatus, dorso inflatus, ultimus angustior valde descendens, ante aperturam paullulum ascendens. Apertura verticalis, angulato-circularis, intus aurantiaca, peristoma multiplicatum crassissimum, aurantiacum, subtus protractum, margine externo ad angulum insertionis sursum producto. Operculum normale, intus castaneo-callosum, anfr. 2½—3, extus convexiusculum, albidum, anfr. 7, marginibus lamellatim elevatis. Axis 47, diam. anfr. penult. 23, aperturæ diam. intus 15½, c. perist. 19½. Peristoma usque ad 8 mill. crassum.

HAB.—Per totam vallem fluminis Perak (*J. de Morgan*), Larut (*Ind. Mus.*).

The small collection from Larut which I received for inspection in 1885, contained this magnificent species, and I had determined to name and to describe it when I saw the notice of de Morgan's paper containing two species of *Hybocystis*. Presuming that one of these might be the Larut form, I delayed the publication until I had received the paper itself. Although the author's description is again insufficient, still I am convinced that his *H. elephas* from Perak is the same as the one from Larut. He gives even greater dimensions: long. 50—57, diam. 24—27, diam. apert. 17—20 mill.

If I am tolerably certain of this identification, I am not quite sure that the shell is really a novelty. There are three species of *Hybocystis* known, *H. gravida*, Bens., from Burma (Moulmein), *mouhoti*, Pfr., from Cambodja,

and *myersi*, Haines, from Siam. Of none of these I have been able to compare specimens; from the published descriptions I glean the following differences between the four forms.

Name.	<i>gravidā.</i>	<i>mouhoti.</i>	<i>myersi.</i>	<i>elephas.</i>
Axis.	35	35	39	50—57 mill.
Umbilication.	Perforate.	Subumbilicate.	Narrow.	Narrow.
Colour.	Whitish brown (fusco-albida).	Deep violet brown (saturate fusco-violacea).	Incarnate brown (carneo-fusca).	Reddish incarnate or orange.
Sculpture.	Rather smooth (læviscula, vix striatula).	Slightly striate (striatula).	Sublævigate.	Sublævigate.
Last whorl.	* * * * * * Slightly and suddenly ascendent.	Foveolato-malleatus. Deeply descendent, ascendent at the aperture.	With irregular spiral sulci. Obliquely descendent.	With distinct rather irregular transverse stripes. Strongly descendent, close to the aperture very little ascendent.
Suture.	Impressed, marginate.	Not mentioned.	Slightly impressed.	Impressed, very distinctly marginate.
Aperture.	Circular.	Angulate oval.	Angulate oval.	Almost circular.
Peristome.	Whitish, incrassate, with an inner groove (intus late sulcatum).	Orange red, duplicate, outer margin at the insertion produced upwards.	Incrassate, the upper insertion angulate.	Orange, multiple, abnormally thick, outer margin at the insertion produced upwards.

Imperfect as this comparison from mere diagnosis must necessarily be, it seems to entitle the Perak shell to specific distinction.

56. Mr. de Morgan mentions (l. c., p. 70) a second species, *H. jousseaumei*, de Morg., from the Pluss valley, which is said to differ from *H. elephas* by the much smaller size, the white colour, the greater size of the last whorl at its beginning, the penultimate whorl having a rather prominent gibbosity at the right side, the flattening of the last whorl being more distinct, the margination of the suture deeper impressed, the narrower umbilicus, and the less reflected peristome. The

operculum has on the inner side a small dish-like prominence with a central nucleus, the outer side is more convex than in the last species. Axis 45, diam. 21, apert. diam. 15 mill. As the author does not mention how many specimens he found of this species which accompanied *P. elephas*, it may be but an individual deviation.

HYDROCENIDÆ.

57. *GEORISSA MONTEROSATIANA*, Godwin-Austen & G. Nevill.

Godwin-Austen & Nevill, Proc. Zool. Soc., 1879, p. 739, t. lix, f. 6.

Buket Pondong (*Dr. Townsend, R. Hungerford*).

58. *GEORISSA SEMISULPTA*, Godwin-Austen & G. Nevill.

Godwin-Austen & Nevill, l. c., p. 740, t. lix, f. 3, 3a.

Based on a broken specimen from Buket Pondong, not found by Mr. Hungerford.

I have not seen any freshwater shells from Perak; the second volume of Nevill's Handlist (1884) mentions only the following species from that region:—

p. 6. *AMPULLARIA TURBINIS*, Lea, var. *SUBAMPULLACEA*, G. Nev.
Perak (*Dr. Townsend*).

p. 22. *PALUDINA BENGALENSIS*, Lam., subspec. *POLYGRAMMA*, v. Mart.
Qualla Kangsa (*Dr. Townsend*).

p. 256. *MELANIA EPISCOPALIS*, Lea.
Qualla Kangsa (*Dr. Townsend*).

p. 280. *MELANIA JUGICOSTIS*, Hanley.
Qualla Kangsa (*Dr. Townsend*).

Manila, August, 1886.

XVII.—*On Solar Thermometer Observations at Allahabad.*—By S. A. HILL, B. Sc., Meteorological Reporter to the Government of N.-W. Provinces.

[Received October 26th;—Read November 3rd, 1886.]

In April, 1883, I sent to the Society a paper on the measurement of solar radiation by means of the black-bulb thermometer *in vacuo*,* in which paper a very decided variation of solar heat emission during

* See Journal Vol. LII, Part II.